



AIRCRAFT ACCIDENT FINAL REPORT
A02/19
Air Accident Investigation Bureau (AAIB)
Ministry of Transport, Malaysia

BD100 Challenger Registration 9M-TST
at Sultan Abdul Aziz Shah Airport, Subang, Selangor
on 18 March 2019



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**AIR ACCIDENT INVESTIGATION BUREAU (AAIB)
MALAYSIA**

ACCIDENT REPORT NO. : A 02/19

OPERATOR	:	BERJAYA AIR
AIRCRAFT TYPE	:	BOMBARDIER BD100-1A10
NATIONALITY	:	MALAYSIA
REGISTRATION	:	9M-TST
PLACE OF OCCURRENCE	:	SULTAN ABDUL AZIZ SHAH AIRPORT, SUBANG, KUALA LUMPUR
DATE AND TIME	:	18 MARCH 2019 AT 0311LT

The sole objective of the investigation is the prevention of accidents and incidents. In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of this investigation to apportion blame or liability.

All times in this report are Local Time (LT) unless stated otherwise. LT is UTC +8 hours.

INTRODUCTION

The Air Accident Investigation Bureau of Malaysia

The Air Accident Investigation Bureau (AAIB) is the air accident and serious incident investigation authority in Malaysia and is responsible to the Minister of Transport. Its mission is to promote aviation safety through the conduct of independent and objective investigation into air accidents and serious incidents.

The AAIB conducts the investigation in accordance with Annex 13 to the Chicago Convention and Civil Aviation Regulations of Malaysia 2016.

It is inappropriate that AAIB reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

In accordance with ICAO Annex 13 paragraph 4.1, notification of the accident/serious incident was sent on 20 March 2019 to the State of Registry/Occurrence, Operator, Design, Manufacturer and ICAO as the aircraft involved has a maximum mass of over 2,250kg. A copy of the Preliminary Report was subsequently submitted to the Operator on 24 April 2019.

In accordance with ICAO Annex 13 paragraph 6.3, a copy of the Draft Final Report was sent on 17 Sep 2020 to the State of Registry/Occurrence, Operator, Design and Manufacturer inviting their significant and substantiated comments on the report.

Unless otherwise indicated, recommendations in this report are addressed to the investigating or regulatory authorities of the State having responsibility for the matters with which the recommendations are concerned. It is for those authorities to decide what action is taken.

TABLE OF CONTENTS

CHAPTER		TITLE	PAGE NO
		TITLE PAGE	i
		INTRODUCTION	ii
		TABLE OF CONTENTS	iii – iv
		ABBREVIATIONS	v
		SYNOPSIS	1
1.0		FACTUAL INFORMATION	
	1.1	History of the Flight	2
	1.2	Runway Activities Prior to the Aircraft landing	3 – 4
	1.3	Injuries to Persons	4
	1.4	Damage to Aircraft	5 – 10
	1.5	Other Damage	11 – 13
	1.6	Personal Information	14
	1.7	Aircraft Information	15
	1.8	Meteorological Information	15
	1.9	Aids to Navigation	15
	1.10	Communications	16
	1.11	Aerodrome Information	16
	1.12	Flight Recorders	16
	1.13	Wreckage and Impact Information	16
	1.14	Medical and Pathological Information	16
	1.15	Fire	17
	1.16	Survival Aspects	17

FINAL REPORT 02/19

	1.17	Tests and Research	17
	1.18	Organisational and Management Information	17
	1.19	Additional Information	17 – 18
	1.20	Useful or Effective Investigation Techniques	18
2.0		ANALYSIS	18 – 19
3.0		CONCLUSIONS	
	3.1	Findings	19
	3.2	Probable Cause	20
4.0		SAFETY RECOMMENDATIONS	20
		APPENDICES	
A		Runway Activities Prior to the Aircraft Landing	A1 - A6
B		Pictorial Narrative of Events	B1 - B4
5.0		COMMENTS TO THE REPORT AS REQUIRED BY ICAO ANNEX 13 PARAGRAPH 6.3	

GLOSSARY OF ABBREVIATIONS

A

AAIB	Air Accident Investigation Bureau
AFRS	Airport Fire and Rescue Services
ATPL	Airline Transport Pilot's Licence
ATC	Air Traffic Controller
ATIS	Automatic Terminal Information Service

C

CAAM	Civil Aviation Authority of Malaysia
CCTV	Closed-Circuit Television
CVR	Cockpit Voice Recorder

I

ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System

L

LT	Local Time
LDA	Landing Distance Available

M

MAHB	Malaysia Airports Sdn. Bhd.
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N

N/A	Not Available
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P

PAPI	Precision Approach Path Indicator
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S

SAAS	Sultan Abdul Aziz Shah
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V

VHF	Very High Frequency
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SYNOPSIS

An aircraft BD100-1A01 with registration 9M-TST has been cleared to land on runway 15 of Sultan Abdul Aziz Shah Airport, Subang by Subang Control Tower. Pilot in Command make an ILS approach for landing and subsequently landed safely. On deceleration, pilot felt the aircraft had hit something on the runway. Once the aircraft stopped abeam taxiway Foxtrot, the Executive Cabin Crew visually inspected the aircraft through the window and observed the leading edge of left wing was badly damage. After checking the aircraft instrumentation and observed there is no abnormality to aircraft operation, Pilot in Command decided to taxi to Bay 38 for passengers to disembark.

Meanwhile, three workers who were on the runway made a narrow escape by clearing their painting equipment and drove their vehicle away from the runway when the aircraft was on final approach for landing. As the three workers considered the aircraft was too close to them, they tried to warn the escorting vehicle (which was hit by the aircraft) about the aircraft making a landing but was not successful. The escorting vehicle was behind the worker's vehicle approximately 1200 meters away from the threshold of Runway 15 and 120 meters behind the workers' vehicle.

The workers then drove to the Airport Fire Rescue Service (AFRS) to inform them about the accident and requested assistance. One AFRS vehicle, after being cleared by Subang Control Tower proceeded to the accident site and found the driver of the ill-fated vehicle unconscious and still in the driver's seat.

After removing the driver's side door, AFRS crew managed to free the badly injured driver and transferred him onto a vehicle which then transported him to the nearest hospital, Sime Darby Hospital. The driver was pronounced dead on the evening of the following day, 19 Mac 2019.

1.0 FACTUAL INFORMATION

1.1 History of Flight

On 18 March 2019, the aircraft, BD100-1A01 bearing registration 9M-TST with a total of 12 persons on board from Jaipur, India was on final approach for runway 15 at Sultan Abdul Aziz Shah Airport, Subang. Upon getting clearance to land at 0308hrs from Subang Control Tower on frequency 118.2 MHz, without any restriction, the aircraft continued the approach for the landing. At 0311hrs the aircraft landed safely on runway 15. During landing roll, as the aircraft decelerated at the speed of 90 to 100 knots, the crew felt the aircraft hit something on the runway.

Based on Cockpit Voice Recorder (CVR) information, the crew exclaimed “*we hit something*” and did not suggest what had really happened to the aircraft. Pilot in Command stopped the aircraft on the runway adjacent to taxiway Foxtrot for the Cabin Executive to do a visual inspection. Cabin Executive reported that the left wing was damaged badly. There was no abnormality to the aircraft operation and the Pilot in Command decided to continue taxi to Bay 38 at the main terminal via taxiway Foxtrot. All passengers were disembarked for immigration clearance. All crew and passengers did not suffer any injury.

Upon inspection on the wing of the aircraft, the leading edge of the port wing were severely damaged with the metal parts sticking belonged to the roof of the vehicle (Perodua Kembara), which was still on the runway at that time. The vehicle was being used by the MASB technician as an escort to the runway painting vehicle. The Perodua Kembara’s registration was BHL 3446.

AFRS was rushed to the location of accident and arrived at 0321hrs. AFRS reported that the vehicle was badly damaged and lost its entire roof. The vehicle was located approximately 1200 meter from the threshold of Runway 15. The driver (technician) was found stuck in the driver’s seat of the car with his head severely injured. He was removed from the vehicle and transported to Sime Darby Hospital nearby at 0341hrs. He was later pronounced death by the doctor in the evening of 19 March 2019.

1.2 Runway Activities Prior to the Aircraft Landing

The Duty Air Traffic Controller (named as Shift 1) has allowed a vehicle to enter the threshold area of Runway 15 area at time 0050hrs for lighting maintenance work. All communication between the vehicle and the tower was on walkie talkie.

Subsequently at 0100hrs two vehicles comprising an escort vehicle and a maintenance vehicle carrying three contractors' workers for runway centreline painting work were allowed by Duty Air Traffic Controller to enter the runway via threshold runway 15 to do the painting for runway centreline. All communications between the escorting vehicle and Control tower were through the walkie talkie. The contractor's vehicle does not have any means of communications with control tower.

At 0215hrs, tower controller (Shift 2 who took over the shift at 0130hrs) received a request to vacate the runway from the lighting maintenance vehicle through walkie talkie as their work has been completed. Based on this last communication at time 0215hrs, the Duty Air Traffic Controller (Shift 2) has recorded in the tower logbook that maintenance works on the runway has been completed and **all** vehicles had vacated the runway despite there were two other vehicles still on the runway doing painting works.

The contractor workers doing the painting works explained that they started painting the runway centreline from threshold Runway 15 and moved towards threshold Runway 33. They were using the contractor's vehicle moving along the centreline and initially the escorting vehicle followed them closely behind. After a while, the workers realised the escorting vehicle was static as far as approximately 120 meters behind with no apparent reason obvious to them. The controller on duty (Shift 2) handed over his shift at 0300hrs to another controller (Shift 3) with the information that no more work on the runway (as recorded in the log book). There was also no indication of Work in Progress as a reminder on the flight progress strip bay at the tower console.

9M-TST reported his position to tower controller (Shift 3) at nine-mile final runway 15 for ILS approach at 0308hrs. After looking out on the runway to check on any

abnormal activities or unusual lighting (to indicate vehicles present on the runway), clearance for landing was given to 9M-TST after the controller (Shift 3) was sure that the runway was clear for the aircraft to make a landing. Pictorial narrative of these activities as per Appendix A.

When 9M-TST descended lower and approach closer on its final approach, the leader of the contractor’s worker saw the landing light of the aircraft approaching and realised that there was an aircraft coming in for a landing. Fearing of the danger, all three workers boarded their vehicle and drove away from the runway. While making a 180 degrees turn, the driver realised the escorting vehicle was still static at the same last position. Based on witness’s statement they flashed the headlight of the vehicle several times to attract the escort vehicle attention. No response was observed from the escort vehicle, and as the aircraft was getting closer to them, the driver drove his vehicle away from the runway and stop at taxiway Foxtrot to give way for the aircraft to land.

After the aircraft had landed safely, while decelerating with a speed between 90 to 100 knots, the Pilot in Command felt that his aircraft hit something on the runway.

1.3 Injuries to person

Injuries	Crew	Passenger	Others
Fatal	Nil	Nil	1
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	4	8	Nil

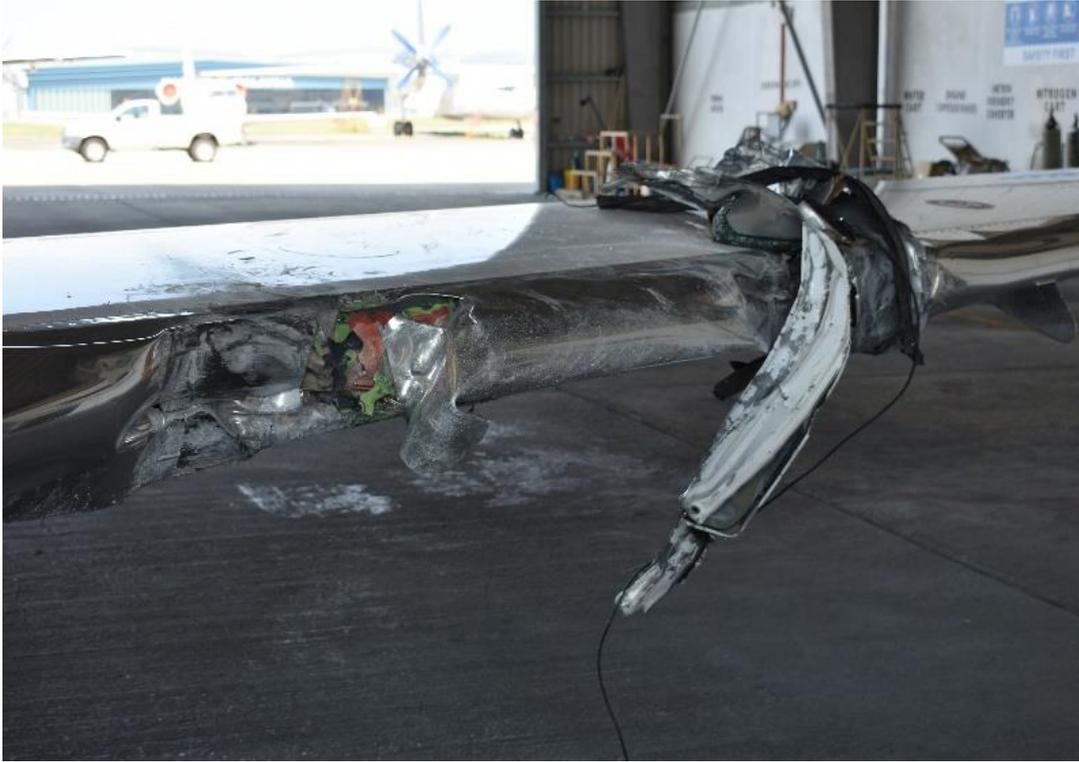
1.4 Damages to aircraft

Severe damage to LH mid wing leading edge and front Spar.



Picture 1 – Mid wing leading edge damages with parts of Kembara vehicle's roof stucked to it.

Severe damage to LH mid wing leading edge



Picture 2 – LH mid wing leading edge

Lower wing surface and fuel panel dented and numerous gauges and scratches on upper and lower wing surface areas.



Picture 3 – Damages to the lower wing surface.

Damages to the trailing edge flaps and flaps carriage.



Picture 4 – Trailing edge flaps and flaps carrier

Damages to the trailing edge flaps and flaps carriage.



Picture 5 - Trailing edge flaps and flaps carrier

Comparison between left wing (top) and right wing (bottom) of the aircraft



Picture 6 - The flaparon of the Left Wing was badly damaged as compared to the Right Wing Flaparon

1.5 Other damages.

One ground vehicle severely damaged after being hit by the aircraft with the roof was totally ripped off and parts of the roof stuck on the left wing leading edge of the aircraft.

The vehicle was hit by the aircraft from the rear. The top parts were ripped off totally with some parts stuck to the left wing of the aircraft.



Picture 7 - Perodua Kembara belonging to MASB

AFRS had to cut off and remove the driver's side door in order to remove the victim from the vehicle



Picture 8 – The driver's seat was in reclining position

The top part of the vehicle



Picture 9 – The roof was totally ripped of from the vehicle

1.6 Personal Information

1.6.1 Aircraft Captain

Status	Commander
Nationality	Malaysian
Age	37 years old
Gender	Male
Licence Type	ATPL (2893)
Licence Validity	Valid until 30 April 2019
Total Hours Operating on BD100	582 hrs 33 mins
Total Flying Hours	7039 hrs 13 mins
Rest Period Since Last Flight	> 24 hours
Medical Expiry Date	Class 1 ATPL / 30 April 2019

1.6.2 Co-Pilot

Status	Co-Pilot
Nationality	Malaysian
Age	61 years old
Gender	Male
Licence Type	ATPL (2596)
Licence Validity	Valid until 31 May 2019
Total Hours Operating on BD100	663 hrs 15 mins
Total Flying Hours	6309 hrs 01 mins
Rest Period Since Last Flight	67 hours
Medical Expiry Date	Class 1 ATPL / 31 May 2019

1.7 Aircraft Information

C of A No.	N/A
C of A Expiry Date	11 May 2019
C of R No.	AR/17/151
C of R Expiry Date	11 May 2020

	Left Engine	Right Engine
Engine Serial Number	P118387	P11838
Time Since New	2888:08	2888:08
Time Since Overhaul (TSO)	New	New
Time Since Fitted (TSF)	2888:08	2888:08
Cycle Since New (CSN)	2305	2301
Cycle Since Overhaul (CSO)	New	New
Cycle Since Fitted (CSF)	2305	2301
Date Fitted	03 Oct 2006	03 Oct 2006
Time Between Overhaul	O/C	O/C

1.8 Meteorological Information

The weather forecasted by Malaysian Meteorological Department for 0200hrs was fine weather with no wind and visibility approximately 7000 meters. Pilot received the weather information through the Automatic Terminal Information System ATIS. On final approach, pilot reported the visibility was more than 10 km with no prevailing weather.

1.9 Aid to Navigation

Pilot making an ILS approach to Runway 15 SAAS Airport Subang with a guidance of PAPI for landing.

1.10 Communication

Communication between aircraft and Subang Tower was on Frequency 118.2 Megahertz (MHz), but communication between Subang Tower and vehicles using walkie talkie (communication using walkie talkie were not recorded on the Air Traffic communication system). Communication between tower and 9M-TST, Coordination between Tower and Control Centre, Tower and AFRS are recorded and the transcript made available by the Air Traffic Control unit in SAAS Airport, Subang.

1.11 Aerodrome information

Sultan Abdul Aziz Shah Airport, Subang (WMSA) Latitude 030752N Longitude 1013253E with an elevation of 89 feet. Runway 15 was used for the landing with no abnormality on the surface condition. 3780 feet of runway length available for the landing (LDA). Runway 15 equipped with Precision Approach Cat 1 Lighting system with PAPI. White runway edge light with controllable intensity.

1.12 Flight Recorders

The Cockpit Voice Recorder was impounded and downloading was done at AAIB Flight Recorder Lab on 18 Mac 2019. Transcript from Air Traffic control also has been secured.

1.13 Impact information

The layout of the airfield and the diagrammatic location of accident as per Appendix B.

1.14 Medical and pathological information

The Post Mortem Examination Report of the victim (vehicle's driver) confirmed that he was pronounced dead on 19 March 2019 at 0645hrs. Autopsy was conducted the following day on 20 March 2019 at 1040hrs. Cause of death is head injury.

1.15 Fire

Not Applicable.

1.16 Survival Aspect

Not applicable.

1.17 Test and research

Not Applicable

1.18 Organisational and Management information

ATC services at SAAS Airport, Subang provided by Civil Aviation Authority of Malaysia (CAAM). The Aerodrome Control consist of Tower Supervisor, Aerodrome Control, Surface Movement Control, Assistant Surface Movement Control and Assistant Tower/Coordinator. During the time range of before and after the accident, Aerodrome Control manning have been reduced to one controller per shift for one and a half hour on each rotation from 0001hrs until 0600hrs in a system named as "Break Shift". The "Break Shift" roster divided among the four controllers rostered for the night shift. Break Shift is not published in any document as an approved ATC Tower manning system.

Malaysia Airports Sdn. Bhd. is the organisation responsible for the maintenance of the airport such as the runway lighting, runway marking and other facilities within SAAS Airport, Subang. All maintenance works for the runway needs to be coordinated between MASB and Control Tower.

1.19 Additional Information

1.19.1 Beacon Light. Even though the painting workers claimed that the beacon light of the escorting vehicle was switched on all the time while they are on the runway, Air

Traffic Controller did not see it when he did the visual inspection of the runway prior to giving the landing clearance. The pilot of 9M-TST also did not see the beacon light while on final for the landing and also after touched down on the runway. Investigation was unable to determine the intensity of the light bulb used for the beacon because the roof of the vehicle including the beacon light were badly damage and so does the beacon light switches. There is no written specification on the minimum intensity required for the beacon light to be used by vehicles operating within manoeuvring area. There is also no other vehicle (Perodua Kembara) used for operation on the airfield for investigators to make a comparison. The beacon light also is not visible on the playback of the Close Circuit Television (CCTV) taken from the ATC tower building.

The reason as why the escorting vehicle were 120 meters away from the worker's vehicle is undetermined.

1.20 Useful or Effective Investigation Techniques

Nil.

2.0 ANALYSIS

All three vehicles which are operating on the runway on the night of the accident were given clearance to enter and operated on the runway. The ATC tower monitored their movement with a flight progress strips placed on the tower console. During handing over between Shift 1 and Shift 2, all information in regard to those vehicles were briefed by the handing over controller and accepted by the taking over controller.

One of the vehicle which has completed their electrical works requested to leave the runway and was acknowledged and cleared to proceed back to their station by the controller of Shift 2. Two vehicles still remain on the runway for centreline painting work. However, the controller on duty recorded in the logbook that **ALL** vehicles has left the runway.

The incorrect information of “runway is clear” handed over to the shift 3 controller. With this incorrect information, the shift 3 controller has given the landing clearance to 9M-TST after visually checking the runway and positively sure that the runway is clear for the aircraft to make a landing.

Controller did not see the beacon light of the ill-fated vehicle from the control tower. Pilots also did not see the beacon light. The beacon light is also not visible on the playback of Control Tower’s CCTV. The intensity of the beacon light used on the vehicle cannot be determined due to badly damaged.

3.0 CONCLUSIONS

3.1 Findings

3.1.1 Landing Clearance.

The Aircrew were properly licence and the landing was done legitimately after achieving landing clearance from Subang Air Traffic Control Tower.

3.1.2 Air Traffic Control shift system.

A total of four Air Traffic Controllers rostered for the night shift took over their duties at 2300hrs. All are fully qualified and license to perform their duties. At midnight, the shift member reduced to one controller for one and a half hour each and rotated among the four controllers until the “Break Shift” end at 06.00 am. Break Shift is not published in any official ATC document.

3.1.3 Communication between Air Traffic and working party.

All communications between Air Traffic Control Tower and maintenance vehicles are using Walkie-Talkie as agreed by both MASB and CAAM. The use of Very High Frequency (VHF) radio communication are recommended by ICAO Doc 9870 – Manual on the Prevention of Runway Incursions where all communications associated

with the operation of each runway (vehicles, crossing aircraft etcetera) should be conducted on the same frequency as utilised for the take-off and landing of aircraft.

3.2 Probable Cause

Incorrect information of vehicle activities on the runway handed over to the taking over controller led to the landing clearance given without realising the runway is occupied.

4.0 Safety Recommendation

4.1 CAAM is to ensure the shift manning especially during low traffic density is to take into consideration of human fatigue as recommended in the ICAO Doc 9966 – The Manual for the Oversight of Fatigue Management Approaches. Any amendment or changes of shift manning need to be officially published.

4.2 MASB and CAAM need to coordinate an effort to ensure that the means of communication between ground vehicle operating within the manoeuvring area and Air Traffic Controller is in accordance to ICAO Doc 9870 – Manual on The Prevention of Runway Incursion, Chapter 4, Paragraph 4.2.6 which require the use of VHF radio.

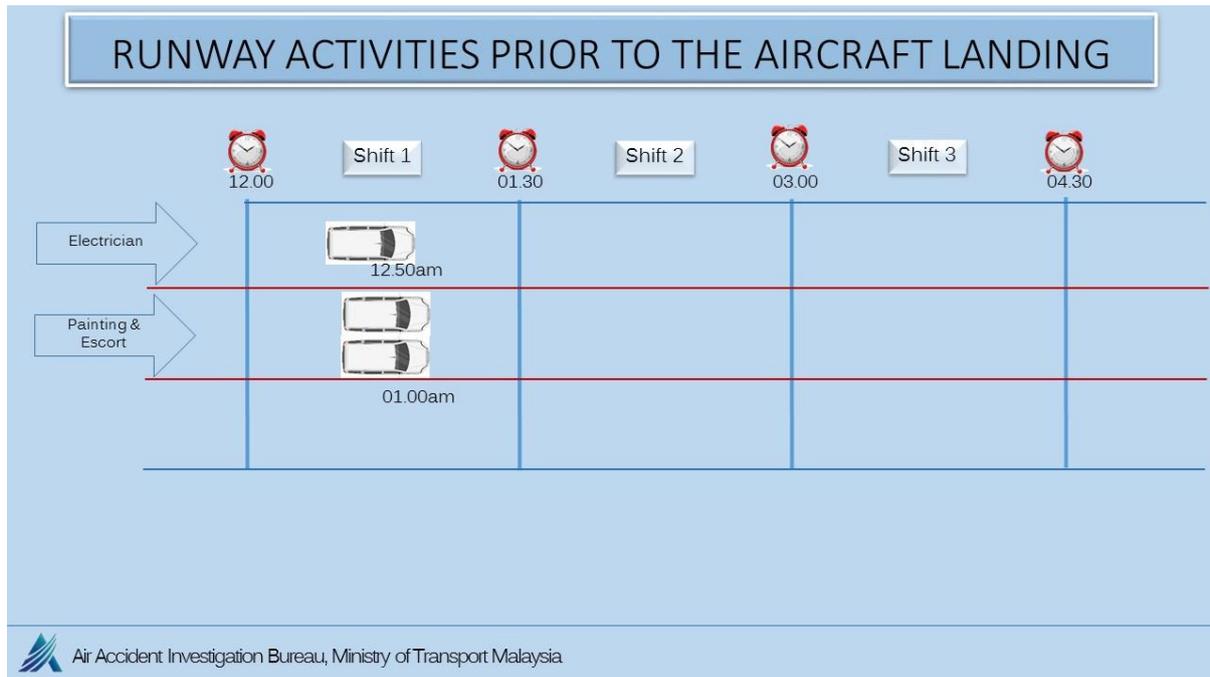
4.3 MASB and CAAM is suggested to have a specific Chapter or Annexes in the existing SOP listing down the specification of vehicle to be used for manoeuvring area including vehicle accessories which need to be installed. For example, the intensity of beacon light to be used on vehicles, coordination phraseology between ATC and driver etcetera. Civil Aviation (Aerodrome Operations) Regulation 2016 stated in Paragraph 40 (1) (d) (ii) **only specify** “all vehicle equipped with rotating beacon in accordance with the colour and characteristic as may be determined by Director General”.

Chief Inspector

AAIB

Ministry of Transport

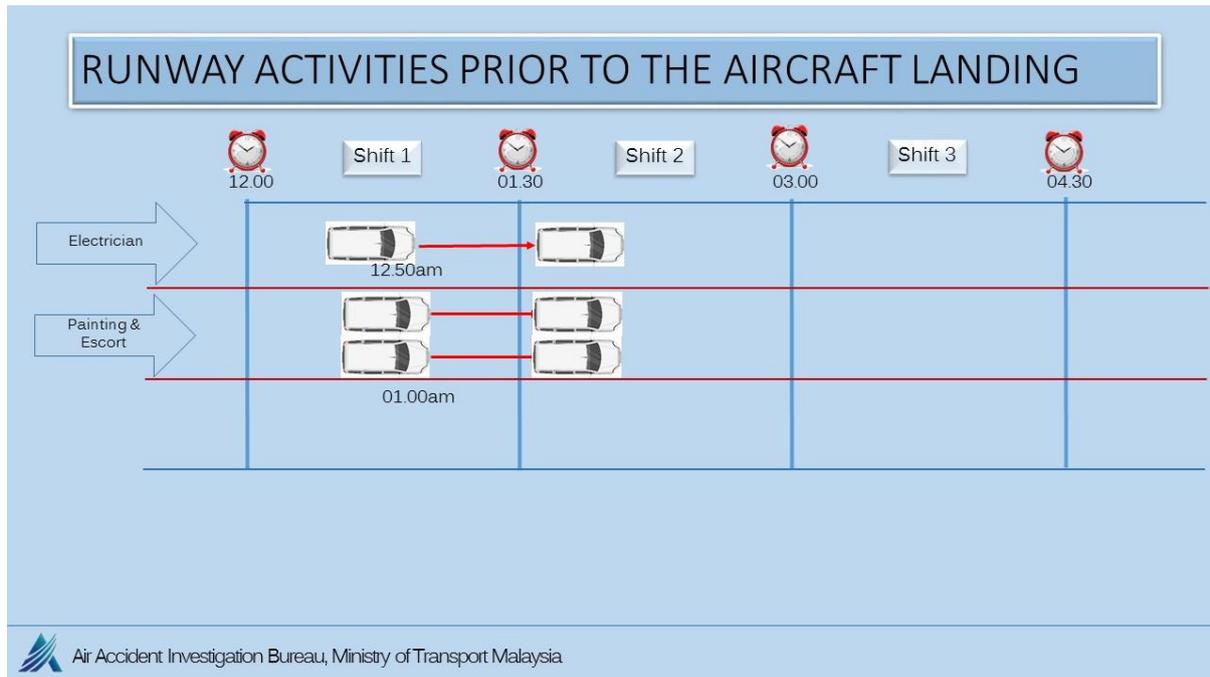
APPENDIX A



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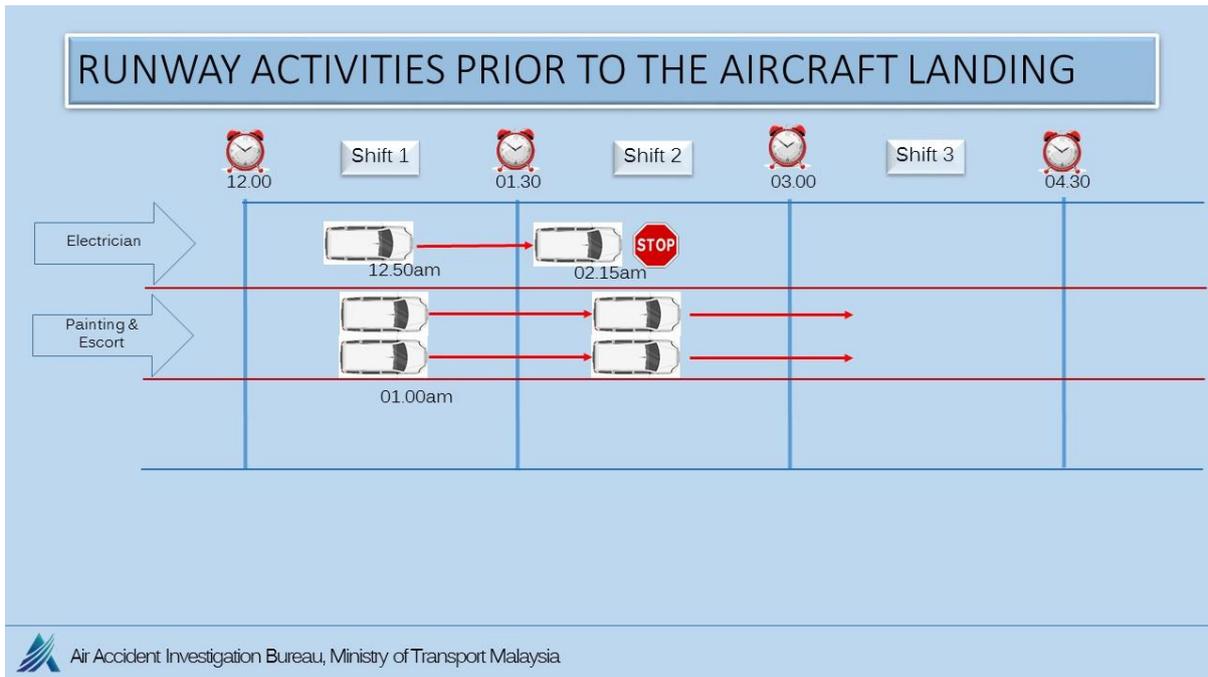
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APPENDIX A



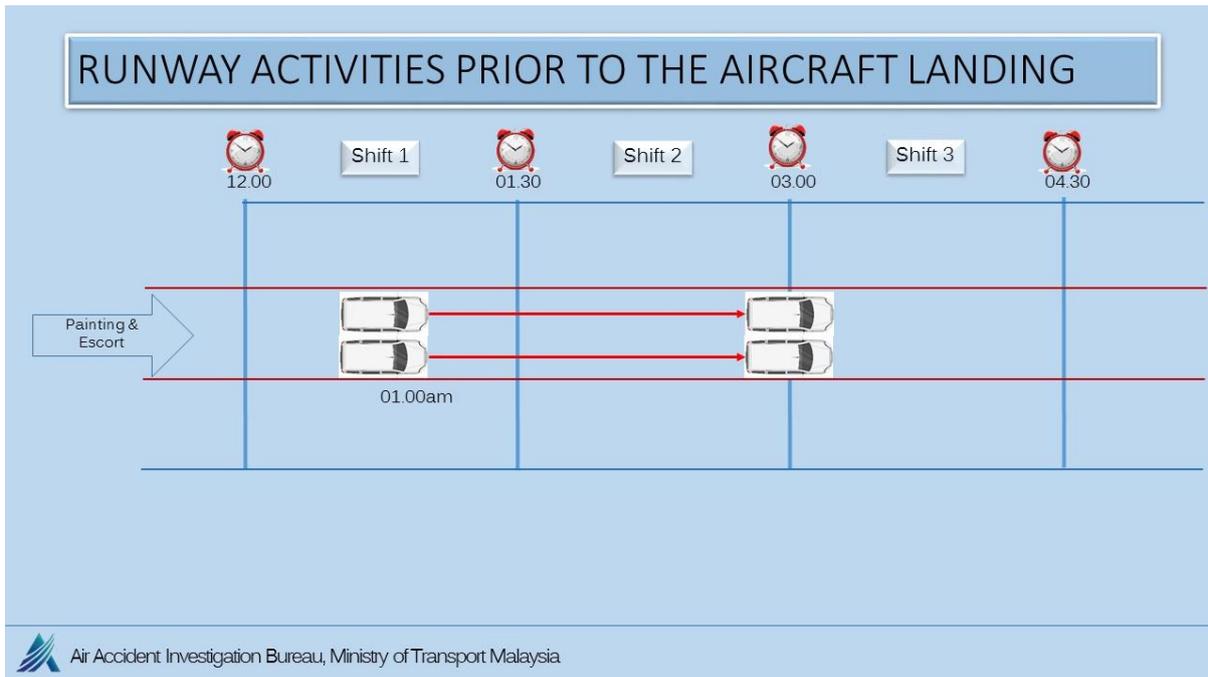
Shift 1 handed over his shift to Controller of Shift 2 at 0130hrs with an information of Work in Progress with 2 separate type of works, lighting with one vehicle and Painting with two vehicles are on the runway.

APPENDIX A



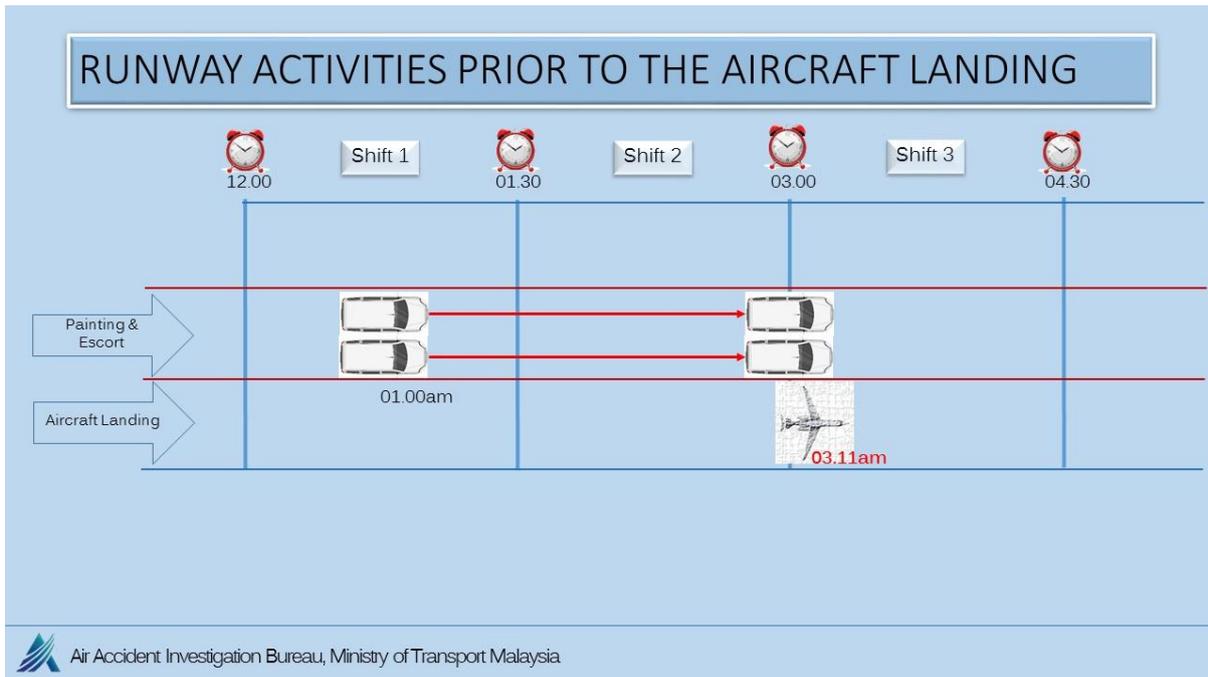
At 0215hrs, tower controller (Shift 2) received a request to vacate the runway from the lighting maintenance vehicle through walkie talkie as their work has been completed. Based on this last communication at time 0215hrs, the Duty Air Traffic Controller (Shift 2) has recorded in the tower logbook that maintenance works on the runway has been completed and **all** vehicles had vacated the runway **despite** there were two other vehicles still on the runway doing painting works.

APPENDIX A



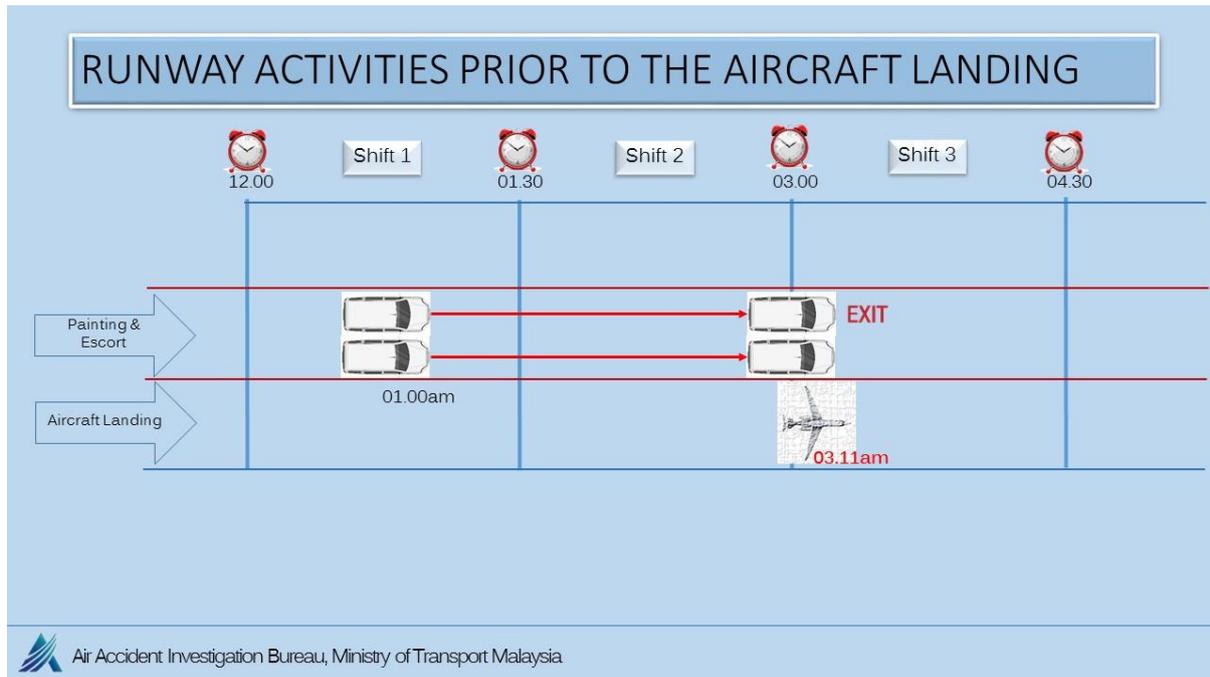
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APPENDIX A



9M-TST reported his position to tower controller (Shift 3) at 9 miles final runway 15 for ILS approach at 0308hrs. After looking out on the runway to check on any abnormal activities or unusual lighting (to indicate vehicles present on the runway), clearance for landing was given to 9M-TST after the controller (Shift 3) was sure that the runway was clear for the aircraft to make a landing.

APPENDIX A



When 9M-TST descended lower and approach closer on its final approach, the leader of the contractor's worker saw the landing light of the aircraft approaching and realised that there was an aircraft coming in for a landing. Fearing of the danger, all three workers boarded their vehicle and drove away from the runway. While making a 180 degrees turn, the driver realised the escorting vehicle was still static at the same last position. Based on witness's statement they flashed the headlight of the vehicle several times to attract the escort vehicle attention. No response was observed from the escort vehicle, and as the aircraft was getting closer to them, the driver drove his vehicle away from the runway and stop at taxiway Foxtrot to give way for the aircraft to land.

APPENDIX B

9M-TST ACCIDENT ON 18 MAR 2019 NARRATIVE OF EVENTS



1	Initial Position and movement of vehicles from Threshold Runway 15 (Not to Scale)
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APPENDIX B



2	Vehicles position when aircraft on short final (Not to scale)
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3	Contractor's vehicle making a turn and vacated the runway (Not to Scale)
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APPENDIX B



4	The escort vehicle hit by the aircraft (Not to Scale)
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